FACT SHEET FOR NPDES PERMIT WA-002442-2

Swinomish Reservation Sewer District, Shelter Bay

SUMMARY

The Environmental Protection Agency (EPA) issues and administers National Pollution Discharge Elimination System (NPDES) permits for industrial and municipal facilities located on tribal lands in the State of Washington. In 1997 a Memorandum of Agreement (MOA) was signed by the Swinomish Indian Tribal Community (SITC), the Washington Department of Ecology (DOE), and the EPA. Under the terms of the MOA, the DOE is responsible for providing technical assistance drafting fact sheets and draft permits for industrial and municipal facilities located within the boundaries of the Swinomish Indian Reservation. EPA is responsible for all administrative procedures, and for issuing and enforcing the final permit with review and assistance by the SITC. This arrangement allows the SITC to move towards administering the Federal Clean Water Act within the Swinomish Indian Reservation to protect the reservation waters for the beneficial use of all.

The Shelter Bay Community wastewater treatment plant is an NPDES minor facility treating domestic sewage from residences located within the Swinomish Indian Reservation on land leased to residents of the Shelter Bay Community. No industrial wastewater will be discharged to the sewage treatment plant under current zoning by the SITC government. The treatment plant provides secondary (biological) treatment of wastewater using an oxidation ditch, settling basins, and chlorine disinfection. Effluent is discharged to the Swinomish Channel through a submerged diffuser.

The wastewater constituents of concern are 5-day biochemical oxygen demand (BOD_5), suspended solids, fecal coliform bacteria, and chlorine. These pollutants are limited in the permit to levels that meet technology-based and water quality-based requirements. Shelter Bay wastewater treatment plant is required to meet new water quality-based limits for chlorine within three years of permit issuance. Ammonia may also be of concern, however more data are required to determine if permit limits for ammonia will be necessary in the future. Ammonia levels in the effluent will be evaluated, but levels of this substance are expected to meet water quality standards. Trace levels of heavy metals and other pollutants are present in the effluent at levels expected to meet Washington state water quality standards within an authorized mixing zone. These findings are consistent with wastewater generated solely by households.

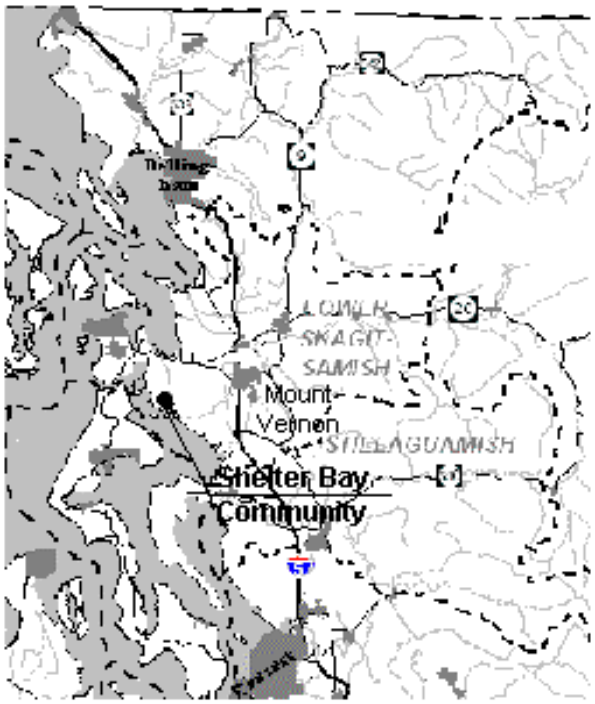

Figure 1: Vicinity map showing the location of the Shelter Bay WWTP on the Swinomish Reservation. Discharge goes to the Swinomish Channel.

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA may delegate responsibility to administer the NPDES permit program to the states and tribal authorities.

This fact sheet and draft permit have been prepared and will be issued per the terms of a Memorandum of Agreement between the Swinomish Indian Tribal Community (SITC), Environmental Protection Agency (EPA), and the Washington Department of Ecology (DOE). The agreement was signed by all parties in the spring of 1997. It is intended to facilitate intergovernmental cooperation among the three parties. The draft permit and fact sheet have been written as part of a technical review report by DOE as specified in the agreement. The SITC has reviewed the technical report for compliance with the rules and regulations for the Swinomish Indian Reservation. EPA is responsible for the administrative procedures for issuing and enforcing the final permit. EPA is the "Permit Administrator" referred to in the permit at the time this permit is issued. The SITC is moving towards applying for delegation from EPA to administer the NPDES permit program for discharges within the exterior boundaries of the Swinomish Indian Reservation

For this permit, the SITC and the Permit Administrator have elected to use the Washington State water quality criteria for surface waters (Washington State Administrative Code Chapter 173-201A) in lieu of their own standards.

Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (40 CFR 124.10). Notice to the public, of the proposed issuance of the permit, will be published in the Skagit Valley Herald. The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures). Errors and omissions identified in this review have been corrected before going to public notice.

GENERAL INFORMATION	
Applicant & Mailing Address	Shelter Bay Community, Inc., Box A, LaConner, WA 98257
Facility Name and Location	Swinomish Reservation Sewer District, Shelter Bay, 101 Samish Place, La Conner, WA (Located within the Swinomish Indian Reservation)
Responsible Official	Bob Masterman, Jr. – Community Manager (360) 466-3805 fax (360) 466-4733
Facility Contacts	Terry Nemeth – Operator (360) 202-2391
Type of Treatment:	Secondary Biological Treatment: Activated Sludge process, oxidation ditches
Discharge Location	Swinomish Channel Latitude: 48° 23' 12" N Longitude: 122° 30' 16" W.

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

The Shelter Bay Community wastewater treatment plant (WWTP) was originally constructed in the early 1970's with a design flow of 60,000 gallons per day (gpd). The plant expanded to a design flow of 100,000 gpd (average daily flow for the maximum month) in 1984. The last expansion was undertaken in 1994 to increase the design flow to 227,000 gpd. The plant is designed to meet secondary biological treatment standards in federal and Washington State regulations.

The service area for this WWTP is fixed to a maximum build out of 932 lots. The Shelter Bay Community operates on land leased to the year 2044 from the SITC. The lease agreement fixes the size of the service area. The latest plant expansion was designed to provide adequate capacity to treat wastewater generated on the ultimate build out of the leased lands. The estimated build out population is 2,500 people. The plant receives no discharges from industrial sources and no industrial discharges are anticipated in the future because the SITC has not zoned any of the land in the service area for commercial or industrial use.

COLLECTION SYSTEM STATUS

The permit application lists the system as having 9.5 miles of separate sanitary sewers. Figure 2 shows the flows through the plant from 1994 through the summer of 1998. The difference between peak flows and average flows as well as the moderate variation in average flow between summer and winter months shows that the system does not have any unusual inflow and infiltration problems.

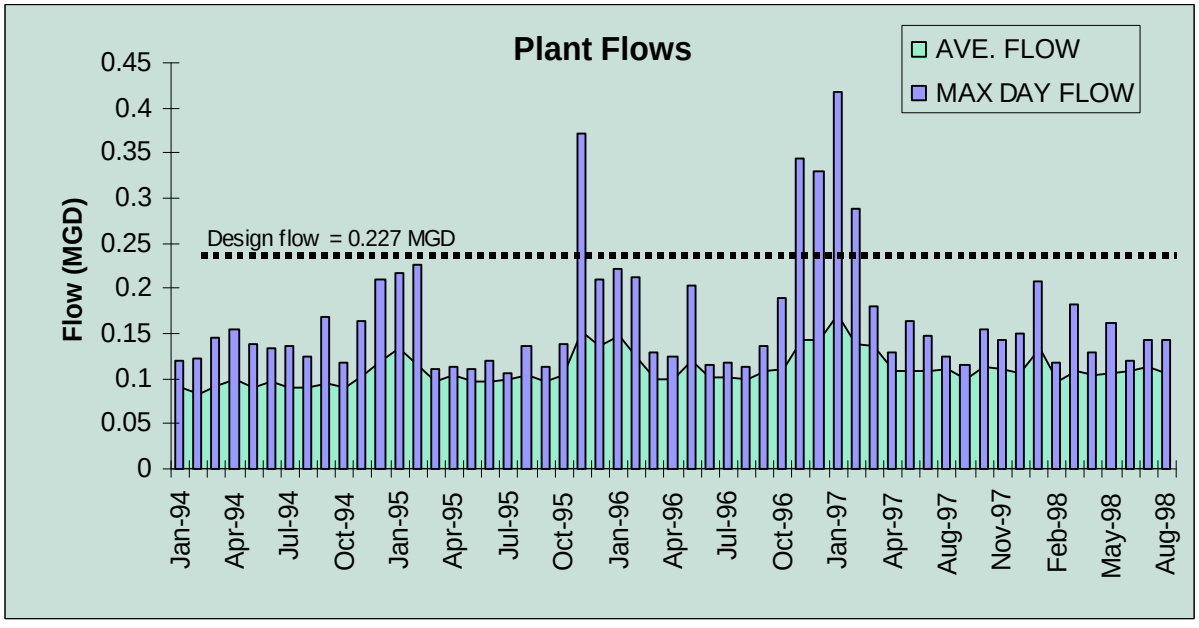

Figure 2: Average daily and maximum daily flows for the period of January 1994 to August, 1998.

TREATMENT PROCESSES

This facility provides secondary treatment of domestic wastewater (sewage). Influent wastewater from households enters the plant through a bar screen and flows to an oxidation ditch. Influent is aerated and eaten by bacteria in the oxidation ditch for about one day. The ditch contents flow to a secondary clarifier where solids and the bacteria mass is settled, and the settled wastewater then flows to a chlorine contact chamber where it is mixed with chlorine and held for about an hour to destroy bacteria and pathogens. Effluent flows through the outfall pipe to the Swinomish Channel for discharge. The settled solids and bacteria mass from the secondary clarifier are routed partly back to the oxidation ditch and partly "wasted" to a storage tank and are dewatered to produce raw sewage sludge. Sludge is hauled off of the SITC lands to a permitted facility in Washington State for additional treatment and disposal. Currently the sludge is hauled to Choker Farms in Whatcom County for treatment and land application. The plant process diagram is shown in figure 3.

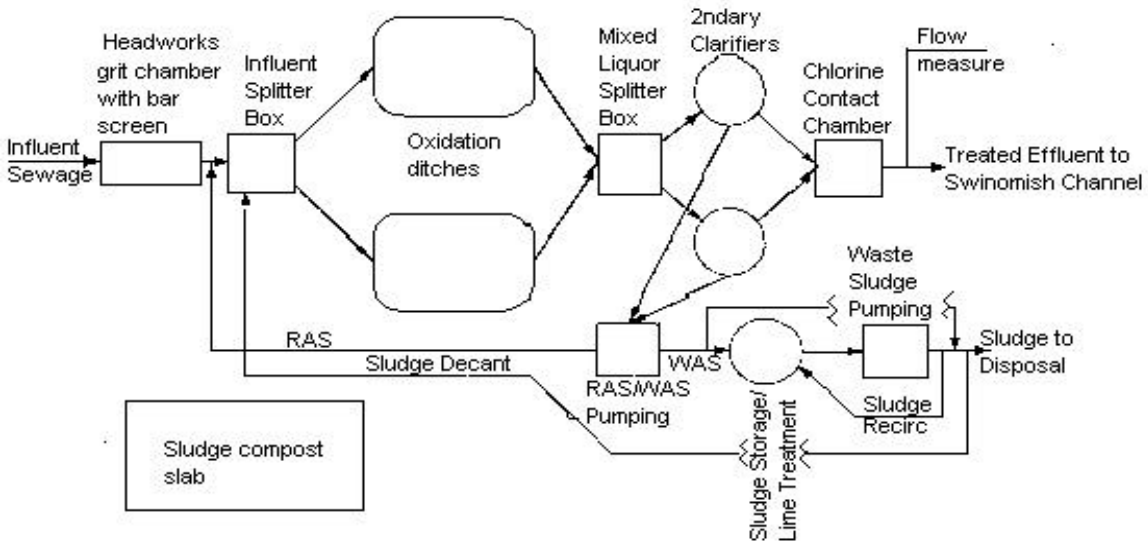

Figure 3: Shelter Bay WWTP process schematic.

DISCHARGE OUTFALL

Secondary treated and disinfected effluent is discharged from the facility via a submerged single port outfall pipe into the Swinomish Channel. The outfall is located about 200 feet from the shore at a depth of 15 feet.

RESIDUAL SOLIDS

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum and screenings are drained and disposed of as solid waste at the local landfill. Solids removed from the secondary clarifier are hauled to another facility for treatment and disposal. The facility selects sludge disposal methods to minimize disposal costs. At the time this fact sheet is drafted,

the facility is shipping sludge to Choker Farms in Whatcom County for treatment and disposal. Choker Farms has been issued a general permit from DOE for sludge/biosolids processing, treatment, and land application.

Table 1: Sludge monitoring results for 1994 through 1998.

all units are mg/Kg dry weight	01-95	10-96 (average)	10-97	2-98	maximum value	Except Qual Standard	Ceiling level
arsenic	ND (<2.2)	ND (<0.5)	ND (<1.0)	4.2	4.2	41	75
cadmium	0.3	2.1	2.0	2.0	2.1	39	85
Chromium (no longer required)	1.8	78	18	12.9	78	1200 (deleted)	3000 (deleted)
copper	20	ND (<5)	93.2	185	185	1500	4300
lead	ND (<1.5)	ND (<10)	10.2	17.7	18	300	840
mercury	ND (<0.18)	0.8	ND (<0.05)	0.3	0.8	17	57
Molybdenum	0.9	ND (<0.5)	ND (<1)	3.1	0.9	18	75
nickel	3.0	59	ND (<1)	23	59	420	420
Selenium	ND (<2.2)	ND (<0.25)	ND (<0.5)	4.1	4.1	100	100
zinc	50	439	519	426	519	2800	7500

ND= Not detected. The practical quantitation limit is listed in parenthesis.

Table 1 lists biosolids monitoring data for 1995 through 1998. The maximum concentration for these metals is significantly below the exceptional quality standards for biosolids. The sludge has met the Class A requirements in 40 CFR 503 for these metals consistently over the last four years. The Permittee is required to continue monitoring for these parameters. The reasons for not requiring any sediment monitoring are the above listed sludge monitoring results, the ongoing secondary treatment of the effluent to remove most of the solids in the course of treatment, and solely domestic sources of waste.

PERMIT STATUS

The previous permit for this facility was issued on March 10, 1989 and expired on March 7, 1994. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), pH, and Fecal Coliform bacteria.

An application for permit renewal was submitted to the Permit Administrator in 1997.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

Representatives of the SITC, DOE, and EPA jointly inspected the facility on December 18, 1997 for permit compliance but did not sample any effluent or biosolids. The facility appeared to be in compliance with 1989 permit limitations during the inspection.

During the last four years, the Permittee has remained in compliance based on Discharge Monitoring Reports (DMRs) kept to report the results of monitoring done by the facility. Occasional effluent violations were reported by the facility prior to 1994. In 1994, Shelter Bay upgraded the facility and hired it's own personnel to run the plant to replace a contract operator.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the discharge was reported in the NPDES application and in discharge monitoring reports. The effluent is characterized in Table 2 for the period of December, 1996 through November, 1997:

Table 2: Wastewater Characterization for the Shelter Bay WWTP.

Parameter	Annual average	Highest monthly average value	Average monthly Permit limit
BOD_5	4 mg/L 4 lb./day	10 mg/L 5 lb./day	30 mg/L 22 lb./day
TSS	3 mg/L 3 lb./day	8 mg/L 5 lb./day	30 mg/L 17 lb./day
Percent removal of BOD_5 and TSS was at least 94%			Minimum 85%
Fecal Coliform Bacteria	30 CFU /100mL (median)	61 CFU/100mL	200 CFU/100mL
pH varied from 6.5 to 7.4 standard units			6.0 to 9.0

This facility has produced a high quality effluent consistently over the last several years.

PROPOSED PERMIT LIMITATIONS

Federal regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133). Water quality-based limitations are based upon compliance with the Washington State Surface Water Quality Standards (Chapter 173-201A WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992). The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis and the limits necessary to meet the applicable rules and regulations for domestic wastewater treatment were determined and included in this permit. Effluent limits were not developed for all pollutants that may be reported on the application as present in the effluent. Some pollutants are not treatable at the concentrations reported, not controllable at the source, and/or don't have a reasonable potential to cause a water quality violation. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Permit Administrator.

DESIGN CRITERIA

This facility is designed to treat specific quantities of flow and organic loading. Exceeding those criteria on a long-term basis increases the risk of violating the effluent limits. In general, the plant should be operated at or below these design criteria to reliably comply with the limitations

in the permit. The mass-based limitations are calculated based on the average flow for the maximum month.

The design criteria for this treatment facility are taken from the plans and specifications prepared by Inca Engineers, Inc. and are as follows:

Table 3: Design Standards for Shelter Bay Community WWTP.

Parameter	Design Quantity
Maximum monthly average flow	0.2274 MGD
Average monthly flow	0.1836 MGD
Peak flow (daily assumed)	0.5685 MGD
BOD_5 influent loading	498 lb./day
TSS influent loading	498 lb./day
Design population	2,488

The relationship between the design influent loading and actual loading to the plant is depicted in Figure 4. The influent loading to the plant is well below the design loading. The plant is of adequate capacity to treat influent flows for the next five years and beyond.

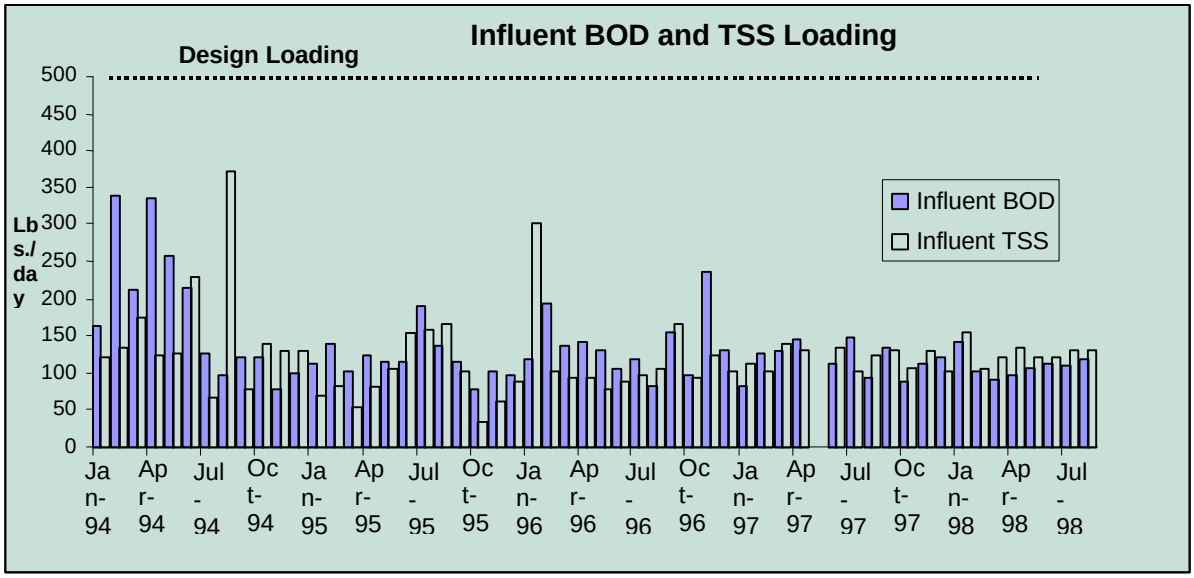

Figure 4: Average monthly influent loading for 1994 to 1998.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by federal regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133. These regulations are performance standards that constitute best available technology for treatment for municipal wastewater.

The technology-based limits for pH, BOD_5, and TSS are from 40 CFR Part 133; fecal coliform is from WAC 173-221-040. Chlorine is based on best professional judgment.

Table 4: Technology-based Limits.

Parameter	Limit
pH:	shall be within the range of 6 to 9 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
Total residual chlorine	Average Monthly Limit = 0.5 mg/L Average Weekly Limit = 0.75 mg/L

The limitation for chlorine is derived from best professional judgement and from standard operating practices. The Water Pollution Control Federation's Chlorination of Wastewater (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5 mg/liter chlorine residual is maintained after fifteen minutes of contact time. See also Metcalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Third Edition, 1991. A treatment plant that provides adequate chlorination contact time can meet the 0.5 mg/liter chlorine limit on a monthly average basis. Using the same proportionality between monthly average and weekly maximum as for BOD_5 and TSS, the corresponding weekly average is 0.75 mg/liter. For additional information on calculating limits, see Appendix C.

The following technology-based mass limits are based on 40 CFR Part 122.45 and 40 CFR Part 133.

Monthly average mass discharge limitation (lb./day) for TSS and BOD_5 are the maximum monthly design flow (0.2274 MGD) x Concentration limit (30 mg/L) x 8.34 (conversion factor) **= 57 lb./day**.

The weekly average effluent mass discharge limitation for TSS and BOD_5 are 1.5 x monthly loading of 57 lb. = **85 lb./day**.

Monthly average mass discharge limitation (lb./day) for chlorine is equal to the maximum monthly design flow (0.2274 MGD) times concentration limit specified in the permit (0.5 mg/L) times 8.34 (conversion factor for equating units) **= 0.95 lb./day**. This means the plant is allowed to discharge less than one pound of chlorine per day diluted in all of the effluent volume discharged in one day.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

The SITC and the Permit Administrator have agreed to use the State of Washington's Surface Water Quality Standards (Chapter 173-201A WAC) for evaluating and limiting the discharge of pollutants from this facility. The SITC may promulgate its own water quality standards in the future. The state standards are consistent with federal guidance and have been approved by EPA. WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

NUMERICAL CRITERIA FOR THE PROTECTION OF AQUATIC LIFE

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC) and the USEPA Quality Criteria for Water, 1986. They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. Most chemical standards are set with two values; one to protect aquatic life from short term lethal effects (acute standard) and the other to protect from adverse long term health effects such as reduced growth or fecundity (chronic standard). When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used for permit limitations.

NUMERICAL CRITERIA FOR THE PROTECTION OF HUMAN HEALTH

The EPA has issued 91 numeric water quality criteria for the protection of human health, (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

NARRATIVE CRITERIA

There are no narrative criteria included in this permit.

ANTIDEGRADATION/ENDANGERED SPECIES ACT

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when the natural conditions of a receiving water are of higher quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

DOE has reported that their review of existing records did not provide enough data to determine if ambient water quality in the Swinomish Channel is either higher or lower than the applicable classification (Class A marine) criteria given in Chapter 173-201A WAC. EPA has accepted DOE's report, therefore, the Permit Administrator will use the Class A marine criteria for this waterbody in the permit. The discharges authorized by this proposed permit should not cause a

loss of beneficial uses. Additionally, the Permit Administrator has determined that the quantity and quality of the effluent being discharged will not adversely affect endangered or threatened species in the area of the discharge.

CRITICAL CONDITIONS

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

MIXING ZONES

The Washington State Water Quality Standards allow the use of mixing zones around the point of discharge to comply with numerical water standards. A very limited acute zone is allowed to meet the acute standards (based one a one-hour exposure every three years) and a larger "chronic" mixing zone is allowed to meet the chronic standards (standards based on four-day average concentration once every three years). The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone during the worst-case receiving water conditions. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100. The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

DESCRIPTION OF THE RECEIVING WATER

The facility discharges to the Swinomish Channel. Other nearby point source outfalls include the discharge from the La Conner WWTP, primary treated wastewater from a boat yard, and 6 stormwater drains from the town of LaConner. Significant nearby non-point sources of pollutants include discharges from crop farms, dairy farms, urban areas, and boat traffic. Characteristic uses include the following: fish migration; fish and shellfish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation; and industrial water supply. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

SURFACE WATER QUALITY CRITERIA

This permit applies Class A marine water quality criteria to the receiving water in the vicinity of the outfall based on Washington State water quality standards. Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Fecal Coliform	14 organisms/100 mL maximum geometric mean & no more than 10% of samples in excess of 43 organisms/100 mL
Dissolved Oxygen	6 mg/L minimum
Temperature	16 degrees Celsius maximum or maximum incremental

	increases no greater than 0.3 degrees Celsius
pH	7.0 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics (Chlorine and Ammonia)	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

Pollutant concentrations (e.g. chlorine, bacteria) in the proposed discharge exceed water quality criteria with technology-based controls which DOE has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC. That zone is limited to a distance of 217 feet in any direction from the outfall terminus and the zone of acute criteria exceedence is limited to a distance of 22 feet from the outfall terminus.

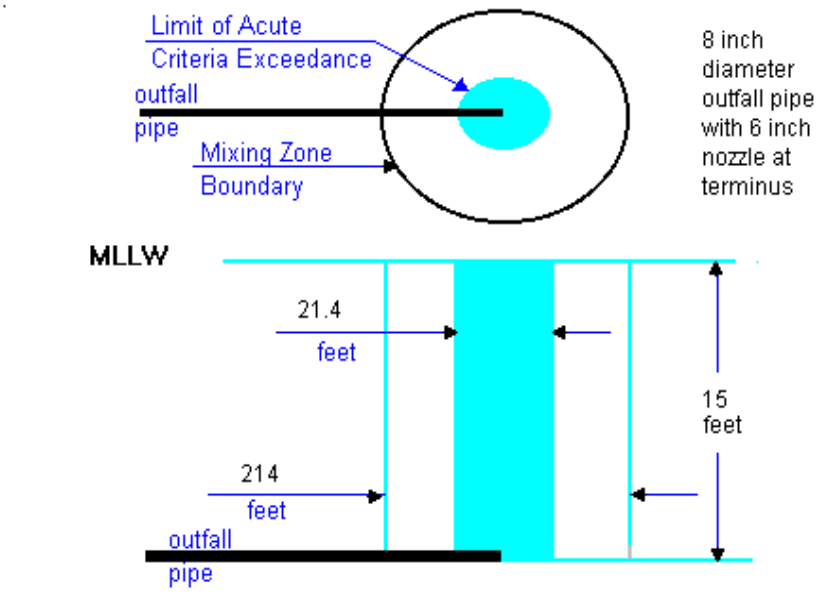

Figure 5: Schematic diagram of the mixing zone for Shelter Bay WWTP mixing zone.

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of the EPA plumes model. The dilution factors have been determined to be (from Appendix C):

	Acute	Chronic
Aquatic Life	11:1	53:1
Human Health, Carcinogen		Not calculated use 53:1
Human Health, Non-carcinogen		Not calculated use 53:1

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near field) or at a considerable distance from the point of discharge (far field). Toxic pollutants, for example, are near-field pollutants--their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as BOD is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred. Thus, the method of calculating water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

The derivation of water quality-based limits also takes into account the variability of the pollutant concentrations in both the effluent and the receiving water.

BOD_5--This discharge with technology-based limitations results in a small amount of BOD loading relative to the large amount of dilution occurring in the receiving water at critical conditions. Technology-based limitations will be protective of dissolved oxygen criteria in the receiving water.

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by simple mixing analysis at critical condition. If the receiving water temperature at the critical condition is 4^oC and the effluent temperature is 20^oC, then the predicted resultant temperature at the boundary of the chronic mixing zone is $(53(4)+1(20))/54=4.29^oC$ and the incremental rise is 0.29^oC. Each of these assumed temperatures exceeds the actual extremes; the class A temperature change limit of 0.3^oC will be met under critical conditions. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--Because of the high buffering capacity of marine water, compliance with the technology-based limits of 6 to 9 will assure compliance with the Water Quality Standards for Surface Waters.

Fecal coliform--The numbers of fecal coliform were modeled by simple mixing analysis using the technology-based limit of 400 organisms per 100 ml and a dilution factor of 53:1. The resulting fecal coliform count would be 7 to 8 organisms per 100 mL. This value is one half of the standard. Data on fecal coliform bacteria levels in the Swinomish Channel are not available. Several other water bodies in the area are listed on the state 303d list for this parameter. The facility should provide for minimizing the discharge of bacteria in the effluent. The technology-based limitation provides for meeting the water quality standard unless the Swinomish Channel has average bacteria levels from other sources above about 7 per 100 mL.

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters with the technology-based limit. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require NPDES permits to contain effluent limits for toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. This process occurs concurrently with the derivation of technology-based effluent limits. Facilities with technology-based effluent limits defined in regulation are not exempted from meeting the Water Quality Standards for Surface Waters or from having surface water quality-based effluent limits.

Prior to the latest plant upgrade, copper and lead were measured in the effluent at levels above the WQ standards (Jones & Stokes, 1992). Cadmium, chromium, nickel, and zinc were measured at levels below the WQ standards. Mercury and silver were tested for, but not detected. A reasonable potential analysis using zero for background receiving water concentrations (See Appendix C) was conducted on copper, mercury, silver, and to determine whether more sampling or permit limitations should be required. The analysis showed that no limits or monitoring for these constituents is needed. This conclusion is supported by the annual sludge analysis for heavy metals (Table 1) – levels of metals in the sludge are at 10 to 20% of the maximum concentrations for meeting exceptional quality standards for sludge.

Chlorine and ammonia are known to be present in significant amounts in the effluent. The facility obtained results for ammonia concentrations in 1999 at the request of the permit author. The maximum effluent concentration of ammonia measured was 5.8 mg/L, and reasonable potential calculations showed no need for an effluent limitation. (The average monthly limit for ammonia would be 30 mg/L, well below the measured value.) Effluent limits were derived for chlorine (and ammonia for informational purposes). The permit provides a three year compliance schedule to meet the new chlorine limit. Quarterly ammonia monitoring will be required to obtain additional data on ammonia and to provide the facility with opportunity to adjust processes to reduce ammonia discharge to minimal practicable levels. Effluent limits were calculated using methods from EPA, 1991 as shown in Appendix C.

The resultant water quality-based effluent limits for chlorine are maximum daily limit of 0.14 mg/L and monthly average limit of 0.05 mg/L. The corresponding mass-based limitations are:

Monthly average mass limitation (lb./day) for chlorine is the maximum monthly design flow (0.2274 MGD) x Concentration limit (0.05 mg/L) x 8.34 (conversion factor) = 0.95 lb./day. The acute dilution, and therefore the daily maximum chorine limitation is based on an effluent flow volume of 0.42 MGD (the highest daily flow on record). The corresponding daily maximum chlorine limit would be this flow (0.42 MGD) x the concentration limit (0.14 mg/L) x 8.34 = 0.49 lb./day. This calculation is included for demonstration, only the concentration limit is included in the permit.

The permit contains a compliance schedule for meeting the water quality-based limits for chlorine. The Permittee will need to evaluate different methods for meeting this limit and providing required disinfection of the effluent. Engineering plans and construction of new features at the WWTP will be necessary to comply with this limitation. During the first three years of the permit, the permittee will be required to meet average monthly limits of 0.5 mg/L and weekly maximum limits of 0.75 mg/L for chlorine (BPJ-based limitations).

WHOLE EFFLUENT TOXICITY

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing.

WET testing is not required for this facility because it discharges less than 1 million gallons per day and has no industrial dischargers within its service area.

HUMAN HEALTH

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the state by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

EPA has accepted DOE's determination that the applicant's discharge does not contain chemicals of concern based on existing data or knowledge. The discharge will be re-evaluated for impacts to human health at the next permit issuance.

SEDIMENT QUALITY

EPA has accepted DOE's determination that this discharge has no reasonable potential to violate the Sediment Management Standards (Chapter 173-204 WAC), designed to protect aquatic biota and human health for the following reasons: 1) No industrial dischargers are or will discharge to the WWTP; 2) Secondary treatment removes settleable solids completely; 3) The sludge monitoring data shows that heavy metals in the sludge are at 10% to 20% of exceptional quality standards set in 40 CFR Part 503. These factors lead to the conclusion that marine sediment testing near the outfall is not justified.

EFFLUENT LIMITATION SUMMARY

Table 5: Comparison of effluent limits with the existing permit issued March 10, 1989.

Parameter	Existing Limits	Proposed Limits
BOD_5	monthly average 30 mg/L, 22 lb./day weekly maximum 45 mg/L, 33 lb./day	monthly average 30 mg/L, 57 lb./day weekly maximum 45 mg/L, 85 lb./day
TSS	monthly average 30 mg/L, 17 lb./day weekly maximum 45 mg/L, 26 lb./day	monthly average 30 mg/L, 57 lb./day weekly maximum 45 mg/L, 85 lb./day
pH	shall be within the range of 6 to 9 standard units	Shall be within the range of 6 to 9 standard units
Fecal Coliform Bacteria	monthly average 200/100 mL weekly maximum 400/100 mL	monthly average 200/100 mL weekly maximum 400/100 mL
Total Residual Chlorine	none	**0.05 mg/L, 0.095 lb./day monthly average** **0.14 mg/L daily maximum** (interim limits of 0.5 mg/L, 0.95 lb./day monthly average, 0.75 mg/L for first three years of permit duration)

Mass limits for BOD and TSS are increased in relation to the permit issued in 1989 because the plant capacity has been increased since the last permit was issued.

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

The monitoring schedule for limited parameters is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. Flow will be monitored continuously. BOD_5, TSS, and fecal coliform will be monitored weekly except for May through September when fecal coliform will be monitored twice weekly because of seasonal swimming use in the Swinomish Channel. Total residual Chlorine and pH will be monitored daily.

Monitoring for ammonia as N is required once per quarter to further characterize the effluent. This pollutant can be toxic directly to aquatic life and can also deplete dissolved oxygen levels in the Swinomish Channel. The Permittee should operate the plant to minimize the discharge of ammonia.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Sludge monitoring is required under 40 CFR 503.

LAB ACCREDITATION

For this permit, EPA and the SITC have elected to use Washington State's laboratory accreditation to ensure data quality. The permit requires all monitoring data for limited parameters to be prepared by a laboratory accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories* using EPA approved methods specified in 40 CFR 136. The laboratory at this facility is accredited for: BOD_5, TSS, pH, fecal coliform, and chlorine.

Accreditation for ammonia will not be required because this parameter is not limited. However, ammonia must be monitored using an EPA approved method as specified in 40 CFR 136.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S4 are based on the authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges.

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant will increase the risk of violating permit limitations and exceeding the water quality standards. To prevent this from occurring, condition S5 requires the Permittee to plan for expansions or modifications of the treatment works before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants.

OPERATION AND MAINTENANCE (O&M)

For this permit, EPA and SITC have elected to use Washington State's operation and maintenance regulations for certifying plant operators and Operations and Maintenance manual for the facility. The proposed permit contains condition S.6. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in permit condition S3 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503. The disposal of other solid waste is under the jurisdiction of the Swinomish Health Authority.

The projected sludge production at this facility is 26 tons/year dry weight. The Shelter Bay WWTP does not have a sludge digester to provide adequate reduction of % volatility required by 40 CFR 503. They have attempted composting sludge, but that process was deemed too expensive. The WWTP dewaters the sludge to 10 to 13 % solids and transports it to Choker Farms in Whatcom County, Washington. At Choker Farms the sludge is processed into Class B biosolids and land applied. Shelter Bay staff reported that they can transport their sludge to the City of Anacortes WWTP for incineration as an alternate method of disposal.

The Permittee has conducted analysis of trace elements as required by 40 CFR 503. The Permittee is required to conduct this analysis once per year based on sludge production between 1 and 264 dry tons per year. The Permittee is required to provide these results to the recipient of its sludge, the sludge processor. The Permittee bears ultimate responsibility for the proper processing use, and disposal of its sludge. The federal regulations emphasize that the sludge generator is responsible for compliance with the regulations even if the generator does not process the sludge into biosolids and use the biosolids. Thus, Shelter Bay staff are required to obtain reports (annual reports would be appropriate) of how the sludge it generated was treated, tested, and used. The regulations require the exchange of information between the generator and processor to insure that the sludge is processed and disposed of in compliance with 40 CFR 503.

The sludge management regulations of 40 CFR 503 were designed so that the standards are directly enforceable against most users or processors of sewage sludge, whether or not they obtain a permit. Therefore, the publication of Part 503 in the *Federal Register* on February 19, 1993 served as notice to the regulated community of its duty to comply with the requirements of the rule, except those requirements that indicate that the permitting authority shall specify what has to be done.

Even though Part 503 is largely self-implementing, Section 405(f) of the CWA requires the inclusion of sewage sludge use or disposal requirements in any NPDES permit issued to a Treatment Works Treating Domestic Sewage (TWTDS). In addition, the sludge permitting

regulations in 40 CFR §122 and §124 have been revised to expand its authority to issue NPDES permits with these requirements. This includes all sewage sludge generators, sewage sludge treaters and blenders, surface disposal sites and sewage sludge incinerators. Therefore, the requirements of 40 CFR §503 have to be met when sewage sludge is applied to the land, placed on a surface disposal site, placed on a municipal solid waste landfill (MSWLF) unit, or fired in a sewage sludge incinerator.

Requirements are included in Part 503 for pollutants in sewage sludge, the reduction of pathogens in sewage sludge, the reduction of the characteristics in sewage sludge that attract vectors, the quality of the exit gas from a sewage sludge incinerator stack, the quality of sewage sludge that is placed in a MSWLF unit, the sites where sewage sludge is either land applied or placed for final disposal, and for a sewage sludge incinerator

Sludge Management: The permittee sends dewatered sludge from its facility to Choker Farms in Whatcom County, Washington. At Choker Farms the sludge is processed to meet pathogen reduction requirements and vector attraction reduction requirements appropriate for land application of Class B biosolids. The facility also has arrangements to transport the sludge to the Anacortes WWTP for incineration as an alternative process method.

To ensure compliance with the CWA and the federal standards for the use or disposal of biosolids (40 CFR 503), the proposed permit contains the following requirements:

State Laws and Future Federal Standards: Pursuant to 40 CFR 122.41(a), a condition has been incorporated into the proposed permit requiring the Permittee to comply with all existing federal and state laws, and all regulations applying to biosolids use and disposal. These standards shall be interpreted using the proposed permit and the EPA guidance documents listed in Health and Environmental General Requirement, below. These documents are used by EPA Region 10 as the primary technical references for both permitting and enforcement activities.

Protection of Surface Waters from Sludge Pollutants: Section 405(a) of the CWA prohibits any practice where biosolids pollutants removed in a treatment works at one location would ultimately enter surface waters at another location. Under this requirement the Permittee must protect surface waters from metals, nutrients, and pathogens contained in the biosolids.

Health and Environmental General Requirement: The CWA requires that the environment and public health be protected from toxic effects of any pollutants in biosolids. Therefore, the Permittee must handle and use/dispose of biosolids in such a way as to protect human health and the environment. Under this requirement the permittee is responsible for being aware of all pollutants allowed to accumulate in the sludge, and for preventing harm to the public from those pollutants.

The U.S. Department of Agriculture can assist the facility in evaluating potential nutrient or micronutrient problems. Additionally, EPA has published the following guidance to assist facilities in evaluating their biosolids for pollutants other than those listed in 40 CFR §503: *Part 503 Implementation Guidance*, EPA 833-R-95-001, and *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge*, EPA/625/R-92/013.

Biosolids Use/Disposal Practices: The permit application indicates the facility transfers biosolids to other facilities, therefore, these practices are authorized in the proposed permit.

Record keeping: 40 CFR 503.17 requires the Permittee to retain records of biosolids pollutant concentrations for a minimum of five years. In addition, the EPA is also requiring the Permittee to keep a record of the receiving facility, and the company that transfers the biosolids to the receiving facility.

Reporting: Reporting is not required under 40 CFR 503 – the facility falls below the threshold for Class I management facilities. The Permittee is to maintain records on sludge quality, treatment, and disposal for review when the facility is inspected.

Inspection and access: The Permittee must notify the receiving facility and any other affected party that, for inspection purposes, EPA or its designee must have access to any facility where the Permittee's biosolids are transported, stored, processed, or disposed.

Contingency Planning: The Permittee is required to write down a contingency plan for treating, storing, and disposing of sludge when its primary disposal is not available. The plant staff have a contingency plan in place now – they can transport the sludge to the City of Anacortes WWTP for incineration. The permit requires that this plan be formalized in writing. The plan will need to be updated if the primary sludge treatment and land application site becomes unavailable.

PRETREATMENT

This permit includes no conditions for pretreatment because of the following reasons. This wastewater treatment facility has no tributary industrial users, and treats only domestic wastewater. The entire service area is zoned for residential use, so no current land use provisions allow construction of either commercial or industrial users that would connect to the system. Therefore, the owner will not be required to investigate or control industrial users, or to initiate a pretreatment program.

OUTFALL EVALUATION

Proposed permit condition S8 requires the Permittee to conduct an outfall inspection and submit a report detailing the findings of that inspection. The purpose of the inspection is to determine the condition of the discharge pipe and nozzle and to determine if sediment is accumulating in the vicinity of the outfall. Proper function of the outfall is necessary for compliance with water quality-based effluent limitations.

GENERAL CONDITIONS

General Conditions are based directly on federal and state law and regulations and have been standardized for all individual municipal NPDES permits drafted by DOE.

Condition G1 requires responsible officials or their designated representatives to sign submittals to the Permit Administrator.

Condition G2 requires the Permittee to allow the Permit Administrator to access the treatment system, production facility, and records related to the permit.

Condition G3 specifies conditions for modifying, suspending or terminating the permit.

Condition G4 requires the Permittee to apply to the Permit Administrator prior to increasing or varying the discharge from the levels stated in the permit application.

Condition G5 prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations.

Conditions G6 relates to permit renewal.

Condition G7 prohibits the reintroduction of removed substances back into the effluent.

Condition G8 states that the Permit Administrator will modify or revoke and reissue the permit to conform to more stringent toxic effluent standards or prohibitions.

Condition G9 incorporates by reference all other requirements of 40 CFR 122.41 and 122.42.

Condition G10 notifies the Permittee that additional monitoring requirements may be established by the Permit Administrator.

Condition G11 describes the penalties for violating permit conditions.

Condition G12 describes requirements necessary for demonstration of an upset condition at the facility.

Conditions G13 states that the Permittee is responsible for reasonable mitigation measures to minimize or prevent a discharge which may adversely affect human health or the environment.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Permit Administrator may modify this permit to impose numerical limitations if necessary to meet Water Quality Standards or Sediment Quality Standards based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Permit Administrator may also modify this permit as a result of new or amended water quality standards or other federal or tribal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the United States and the State of Washington. The Permit Administrator proposes that this permit be issued for 5 years.

REFERENCES FOR TEXT AND APPENDICES

Anne Symonds & Associates in conjunction with Inca Engineers.

1991. Shelter Bay Engineering Report.

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1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

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1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington, D.C.

1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

1983. Water Quality Standards Handbook. USEPA Office of Water, Washington, D.C.

Inca Engineers, Inc.

1992. Plans and Specifications for the Shelter Bay Tribal Sewer District.

Jones & Stokes Associates, Inc.

1992. Water Quality Evaluation for the Shelter Bay Wastewater Treatment Plant Expansion.

Metcalf and Eddy.

1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

1994. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Permit Administrator has tentatively determined to issue a permit to the applicant listed on page 1 of this fact sheet. The draft permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

The Permit Administrator will publish a Public Notice of Draft on November 3, 1999 in the Skagit Valley Herald, post the permit and fact sheet on the world wide web at: http://www.epa.gov/r10earth/offices/water.htm, and directly notify individuals or groups who have expressed interest to allow the public access to the draft permit and fact sheet for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the EPA Regional Office at the address, below. Written comments should be mailed to:

Director, Office of Water

U.S. Environmental Protection Agency, Region 10

1200 Sixth Avenue, OW-130

Seattle, WA 98101

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Permit Administrator will hold a hearing if it determines there is a significant public interest in the draft permit. Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

The Permit Administrator will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Permit Administrator's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Permit Administrator by telephone (206) 553-2108, or by writing to the address listed above.

This permit and fact sheet were drafted by Gerald Shervey of the Washington Department of Ecology NW Regional Office, 3190 – 160th Avenue SE, Bellevue, WA 98008-5452; phone number (425) 649-7215.

APPENDIX B--GLOSSARY

Acute Toxicity--The lethal effect of a compound on an organism that occurs in a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's life span or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Daily Maximum Discharge Limitation--The greatest allowable value for any calendar day.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of rainfall-caused surface water drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (Chapter 173-201A WAC).

Monthly Average --The average of the measured values obtained over a calendar month's time.

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)-- Industrial dischargers to a POTW that have effluent limitations defined in a category (40 CFR 403.6 and 40 CFR chapter I, subchapter N). However, the control authority may make a determination that even though an industrial user belongs to a category that has effluent limits for pretreatment, that industry is not a SIU because there is no reasonable potential for affecting the POTW's operation. A SIU may also be any other industrial user that: 1. discharges an average of 25,000 gallons per day or more of process water, 2. makes up more than 5 percent of the average hydraulic flow (dry weather) or 5 percent of the organic capacity of the plant, or 3. the control authority believes has a reasonable potential to adversely affect the POTW's operation.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Swinomish Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the exterior boundaries of the Swinomish Indian Reservation.

State Waters-- Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Water Quality-based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

Waters of the United States-- means (a) All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide; (b) All interstate waters, including interstate wetlands; (c) All other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds the use, degradation, or destruction of which would affect or could affect interstate or foreign commerce including any such waters: 1. That are or could be used by interstate or foreign travelers for recreational or other purposes; 2. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or 3. That are used or could be used for industrial purposes by industries in interstate commerce; (d) All impoundments of waters otherwise defined as waters of the United States under this definition; (e) Tributaries of waters identified in paragraphs (a) through (d) of this definition; (f) The territorial sea; and (g) Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) through (f) of this definition.

APPENDIX C--TECHNICAL CALCULATIONS

CHEMICAL POLLUTANTS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on DOE's homepage at http.www:wa.gov.ecology.

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. (Last revision date 1-19-95).

Table 6: Permit limit calculations. Limits for chlorine apply. Other limits are calculated for informational purposes.

Permit Limit Calculation Summary

PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translator Acute	Metal Criteria Translator Chronic	Ambient Concentration *mg/L*	Water Quality Standard Acute *mg/L*	Water Quality Standard Chronic *mg/L*	Average Monthly Limit (AML) mg/L	Maximum Daily Limit (MDL) mg/L	Comments
AMMONIA as mg/L of N -see seperate spreadsheet for saltwater fractions	11.00	53.00				5.50	0.83	**30.2**	**60.5**	based on 20 deg C, salinity 18 ppt,pH=8
CHLORINE in mg/L	11.00	53.00				0.013	0.008	**0.05**	**0.14**	

	Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							Statistical variables for permit limit calculation			
	WLA Acute *mg/L*	WLA Chronic *mg/L*	LTA Acute *mg/L*	LTA Chronic *mg/L*	LTA Coeff. Var. (CV) *decimal*	LTA Prob'y Basis *decimal*	Limiting LTA *mg/L*	Coeff. Var. (CV) *decimal*	AML Prob'y Basis *decimal*	MDL Prob'y Basis *decimal*	# of Samples per Month *n*
'AMMONIA	61	43.99	19.4	23.2	0.60	0.99	19.4	0.60	0.95	0.99	4.00
CHLORINE in mg/L	0.143	0.398	0.046	0.210	0.60	0.99	0.046	0.60	0.95	0.99	30.00

Table 7: Estimate of Reasonable Potential to exceed the water quality standards for the constituents listed. Note that for silver, the potential is based on the detection level of the analysis, the pollutant was not detected. This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56.

				State Water Quality Standard		Max concentration at edge of...			CALCULATIONS									
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n				COMMENTS
AMMONIA as mg/L of N -see seperate spreadsheet for saltwater fractions				5.50	0.83	2.07	0.43	**NO**	0.95	0.22	6.00	0.60	0.55	2	3.79	11	53	based on 20 deg C, salinity 18 ppt,pH=8
COPPER - 7440508 6M Hardness dependent	0.83	0.83		4.80	3.10	3.27	0.68	**NO**	0.95	0.05	7.00	0.60	0.55	1	6.20	11	53	
CHLORINE				13	7.50	32.83	6.81	**YES**	0.95	0.90	300.00	0.60	0.55	30	1.20	11	53	
LEAD - 7439921 7M	0.951	0.95		210.00	8.10	10.72	2.22	**NO**	0.95	0.05	20.00	0.60	0.55	1	6.20	11	53	
MERCURY 7439976 8M	0.85			1.80	0.0250	0.10	0.02	**NO**	0.95	0.05	0.20	0.60	0.55	1	6.20	11	53	not detected, valu set at detection level
MERCURY 7439976 8M (human health criteria)	0.85	0.85		100	0.15	0.10	0.02	**NO**	0.95	0.05	0.20	0.60	0.55	1	6.20	11	53	not detected, valu set at detection level
SILVER - 7740224 11M	0.85			1.90	100	1.80	0.44	**NO**	0.95	0.55	10.00	0.60	0.55	5	2.32	11	53	not detected, valu set at detection level
SILVER - 7740224 11M	0.85			1.90	100	4.79	1.17	**YES**	0.95	0.05	10.00	0.60	0.55	1	6.20	11	53	not detected, valu set at detection level

Shaded criteria are dummy values used for calculation purposes. The standards list no value for the shaded entries. For the row labeled MERCURY (human health criteria), the comparison of the human health standard to the concentration at the edge of the mixing zone is a more stringent comparison than the calculations using average dilution and average plant flow used for the correct analysis of mercury concentration to the long term human health standard. Neither mercury nor silver were detected in the effluent for this one test. The potential need for a limit for silver is based on one non-detect sample - the concentration value used is the detection limit. Five similar results for measuring silver would eliminate the call for a limit. This calculation is inconclusive.

CALCULATION OF WQ CRITERIA FOR AMMONIA

Table 8: Spreadsheet for calculation of seawater fraction of unionized ammonia from Hampson (1977). Total ammonia criteria for salt water from EPA 440/5-88-004 and WAC-173-201A.

INPUT =========			
Temperature (deg C)	20.0	20.0	13.0
pH	8.0	7.0	8.0
Salinity (ppt)	18.0	18.0	20.0
Pressure (atm; EPA criteria assumes 1 atm)	1.0	1.0	1.0
OUTPUT ==========			
Molal Ionic Strength (results valid if between 0.35-0.85)	0.365	0.365	0.407
pKa8 (Whitfield model "B")	9.287	9.287	9.292
Percent of Total Ammonia Present as Unionized	3.46%	0.36%	2.06%
Unionized ammonia criteria (mg UINH3/L)			
Acute	0.233	0.233	0.233
Chronic	0.035	0.035	0.035
Total Ammonia Criteria (mg NH3 /L)			
Acute	6.7	65.3	11.3
Chronic	1.01	9.81	1.70
Total Ammonia Criteria (mg N /L)	**Worst case**		
Acute	**5.5**	53.7	9.3
Chronic	**0.83**	8.06	1.40

MIXING ESTIMATE

The amount of mixing provided within the dilution zone was estimated by DOE based on ambient data measured for and reported in a water quality study for this facility (Jones & Stokes Associates, Inc., 1992). That study assigned a larger mixing zone than is currently allowed under Washington state water quality standards. That conclusions of that study did not include Ecology policy that dilution is assumed to be reduced by 50% in estuaries where tidal currents reverse, such as the Swinomish channel. Current velocity data is based on best professional judgement of the author. The estimated velocity of 1 to 6 knots (0.51 to 3.1 M/sec) from the Jones & Stokes report seemed to be too high based on actual data from other locations. Values ranging from 0.05 M/sec to 1 M/sec were assumed. The outfall configuration was taken from construction plans submitted as part of the NPDES application. Receiving water density profiles were taken from Table 2 of the Jones & Stokes report.

The dilution factors calculated for the mixing zone and zone of acute criteria exceedance are summarized in Table 9. For compliance with the chronic standards at the edge of the mixing zone, the critical conditions are the average current velocity coupled with the critical ambient salinity and temperature in the receiving water. For evaluating compliance with water quality standards at the edge of the zone of acute criteria exceedance the critical conditions are the 10 percentile (slow) or 90 percentile (fast) current velocity coupled with the ambient density profile

that yields the lowest dilution. These values were assumed and tested looking for reasonable worst case scenarios.

Dilution zone modeling was performed with Dilution Models for Effluent Discharges, 3rd edition and the computer programs (PLUMES interface) supplied by EPA with manual. Selection of critical conditions was done per the procedures prescribed in DOE of Ecology Permit Writer's Manual. Dilution factors were derived for acute aquatic toxicity and chronic aquatic. A summary of results from the various model scenarios, input conditions, and dilution factors are listed in the Table 9.

The WWTP outfall is 8-inch diameter pipe with a 6" reduction nozzle located at a depth of about 14 feet 200 feet from shore. Current is assumed to flow perpendicular to pipe end. Plant flows from the last four years and design flows are used to check how dilution changes as the flows through the WWTP increase.

Table 9: Summary of data, assumptions, PLUMES model outputs for dilution zone estimate.

SUMMARY	**Aquatic Life dilution factors**	**Acute**	**Chronic**
		11:1	**50:1**

max month design flow	0.23 MGD	Effluent temperature
Max day design flow rate	0.57MGD	Range of 4 to 20 degrees C, use 17
max month flow over last 4 years	0.17 MGD	
max daily flow - last 4 years	0.42 MGD	current velocity based on Jones & Stokes observations and BPJ
Acute zone extends 6.52 M from outfall		Minimal = 0.05 m/sec
Chronic zone extends 65.2 M from outfall		median = .50 m/sec
		Maximum = 1.0 m/sec

Case #	effluent flowrate (MGD)	effluent temp (F)	current speed (M/sec)	Stratification case from Jones & Stokes figure 2.	comments	acute dilution	chronic dilution
1	0.42	17	1	14:10		35	
2	**0.42**	**17**	**0.05**	**14:10**	**Critical acute**	**22.8**	**40**
3	0.42	17	0.5	14:10		39	77
4	0.42	17	0.1	14:10		36	121
5	0.42	17	0.05	17:25		25	45
6	0.42	20	0.05	17:25		25	
7	0.42	4	0.05	17:25		25	45
8	0.42	17	1	17:25		40	573
9	0.42	17	3	17:25		24	350
10	0.17	17	0.05	14:10		27	51
11	**0.17**	**17**	**0.5**	**14:10**	**Critical chronic**	**50**	**106**
12	0.17	17	1	14:10			165
13	0.17	17	1	17:25			430
14	0.17	17	0.5	17:25			418
15	0.17	17	0.05	16:30		28	49
16	0.17	17	0.5	16:30			126
17	0.48	17	0.05	14:10	For future acute	22.8	

18	0.54	17	0.05	14:10	For future acute	22.6	
19	0.6	17	0.05	14:10	For future acute	22.5	
20	0.66	17	0.05	14:10	For future acute	22.5	
21	0.19	17	0.5	14:10	For chronic graph		102
22	0.21	17	0.5	14:10	For chronic graph		99
23	0.23	17	0.5	14:10	For chronic graph		95
24	0.25	17	0.5	14:10	For chronic graph		93
25	0.27	17	0.5	14:10	For chronic graph		90

The model runs that produced the minimum amounts of dilution are shown below. Case 2 is the critical case for acute dilution. Cases 17 through 20 (table 5)show that the acute dilution displays minimal variation over the range of flows predicted as the plant reaches design capacity. Critical conditions over a range of plant flows yields dilution factors of 23 to 22. The value of 22:1, reduced by half for tidal reflux (reversing currents) yields a final acute dilution factor of 11:1.

```
Jan 27, 1999,  14: 5:43  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:   2 of  26
 Title   Shelter Bay WWTP acute                                        linear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
   0.01827         1   0.01827      1000       0.0        17     6.523    19.569
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     4.267    0.1524    0.1524     1.002     1.002     0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048       0.0       1.0  -1.16146       100         0     6.235     4.848
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90    1000.0   16.0837   0.02466    0.0003      0.05     40.61  0.007836
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0      0.05      12.3                                 0.09251    0.1693
         1      0.05      12.2                               buoy flux puff-ther
         2      0.05      13.2                               3.093E-06     1.637
         3      0.05      14.5                               jet-plume jet-cross
         5      0.01        17                                  0.8945     5.485
                                                           plu-cross jet-strat
                                                               206.3     1.209
                                                           plu-strat
                                                                 1.406
                                                             hor dis>=

CORMIX1 flow category algorithm is turned off.
 19.569 m, 64.20 ft                                          >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: SHLTRBAY.VAR;
UM INITIAL DILUTION CALCULATION (linear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                          m
     4.267    0.1524     100.0     1.000     0.000
     2.505     1.369     7.589     12.98     2.959 -> trap level
     1.780     2.429     4.329     22.77     3.966 -> begin overlap
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      2.429m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance         Time
                                             m        sec   hrs
     4.326      22.8     4.326      22.8     6.523     51.15   0.0
     4.031      24.5     4.150      23.8     13.05     181.6   0.1
     3.471      28.5     3.814      25.9     19.57     312.1   0.1
```

Figure 6:Output of the Plumes model for the zone of acute dilution, zone is limited to 22 feet (6.52 M).

The Plumes output for critical conditions used for estimating the dilution at the edge of the mixing zone are shown in figure 7. Department policy recommends using the highest average monthly flow from the last three years as the flow on which to base the dilution; the dilution based on that flow is 106:1. The value of 106:1, reduced by half for tidal reflux (reversing currents) yields a final chronic dilution factor of 53:1. Dilution at the edge of the mixing zone varies with increasing effluent flow. Results for chronic dilution with increasing effluent flow (for future permit limit calculations) are graphed in figure 8.

```
Jan 27, 1999,  14: 6:10  ERL-N PROGRAM PLUMES, Ed 3, 3/11/94  Case:  11 of  26
 Title   Shelter Bay WWTP chronic                                        linear
  tot flow   # ports port flow   spacing  effl sal effl temp   far inc   far dis
  0.007448         1  0.007448      1000       0.0        17      6.52      65.2
  port dep  port dia plume dia total vel horiz vel vertl vel asp coeff print frq
     4.267    0.1524    0.1524    0.4083    0.4083     0.000      0.10       500
 port elev ver angle cont coef  effl den poll conc     decay  Froude # Roberts F
    0.3048       0.0       1.0  -1.16146       100         0     2.542      7872
 hor angle red space p amb den p current   far dif   far vel K:vel/cur Stratif #
        90    1000.0   16.0837    0.2149    0.0003       0.5     1.900  0.007836
     depth   current   density  salinity      temp  amb conc  N (freq) red grav.
       0.0       0.5      12.3                                 0.09251    0.1693
         1       0.5      12.2                               buoy flux puff-ther
         2       0.5      13.2                               1.261E-06    0.3243
         3       0.5      14.5                               jet-plume jet-cross
         5      0.05        17                                  0.3647    0.2566
                                                             plu-cross jet-strat
                                                                0.1270    0.7721
                                                             plu-strat
                                                                 1.123
                                                               hor dis>=

CORMIX1 flow category algorithm is turned off.
 65.2 m, 213.9 ft                                          >0.0 to any m range
Help: F1.  Quit: <esc>.  Configuration:ATNO0.  FILE: SHLTRBAY.VAR;
UM INITIAL DILUTION CALCULATION (linear mode)
 plume dep plume dia poll conc  dilution   hor dis
         m         m                          m
     4.267    0.1524     100.0     1.000     0.000
     3.629    0.9746     3.125     31.49     2.930
     3.472     1.202     1.910     51.51     4.379 -> trap level
     3.283     1.611    0.9486     103.7     9.601
 -> local maximum rise or fall
FARFIELD CALCULATION (based on Brooks, 1960, see guide)
Farfield dispersion based on wastefield width of      1.611m
   --4/3 Power Law--   -Const Eddy Diff-
      conc  dilution      conc  dilution  distance         Time
                                            m        sec   hrs
    0.9468     103.9    0.9468     103.9     13.04     6.878   0.0
    0.9478     103.8    0.9478     103.8     19.56     19.92   0.0
    0.9482     103.8    0.9481     103.8     26.08     32.96   0.0
    0.9478     103.8    0.9480     103.8     32.60     46.00   0.0
    0.9457     104.1    0.9468     103.9     39.12     59.04   0.0
    0.9410     104.6    0.9441     104.2     45.64     72.08   0.0
    0.9337     105.4    0.9397     104.7     52.16     85.12   0.0
    0.9241     106.5    0.9339     105.4     58.68     98.16   0.0
    0.9123     107.9    0.9269     106.2     65.20     111.2   0.0
```

Figure 7: Output of the Plumes model for the chronic dilution zone, zone is limited to 215 feet (65.2 M).

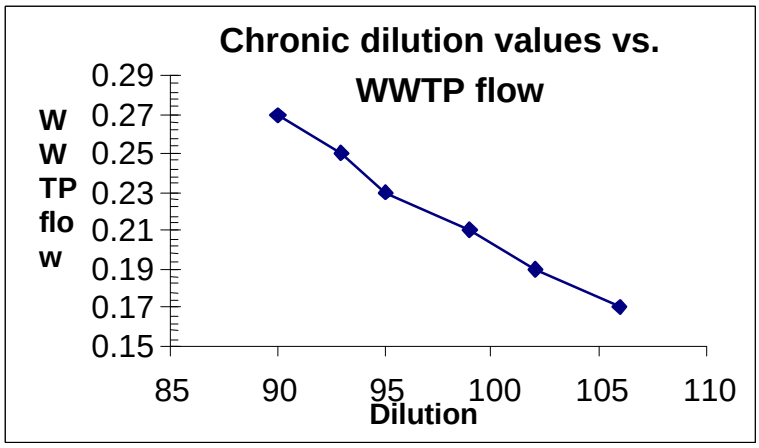

Figure 8: Graph of chronic dilution as a function of flow. As treatment plant discharge volume increases in the future, the permitting administrator should reevaluate the chronic dilution factor and compliance with chronic water quality standards at the edge of the mixng zone.

APPENDIX D--RESPONSE TO COMMENTS